WHAT IS CLAIMED IS:

1. A VSB communication system comprising:

a VSB transmission system for multiplexing coded MPEG data and coded supplemental data having a null sequence inserted therein with multiplexing information included thereto according to supplemental data packets, and transmitting a multiplexed data field; and

a VSB reception system for detecting the required multiplexing information from the multiplexed data field, decoding the multiplexed data field by using the null sequence and the detected multiplexing information, and demultiplexing the multiplexed data into the MPEG data and the supplemental data in response to the multiplexing information.

2. A VSB communication system of claim 1, wherein the multiplexing information of the supplemental data is within the multiplexed data field.

3. A VSB communication system of claim 1, wherein 'P' denotes a number of the supplemental data packets, 's' denotes a supplemental data segment position with respect to a field synchronizing signal within the multiplexed data field, and K1, K2, K3, and K4 indicate offsets for adjusting starting positions of the supplemental data segments with reference to the field synchronizing signal, and

a MAP of the supplemental data segment in the multiplexed data field is expressed by the following equations:

$0 \le P \le 39$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 2P-1};

$40 \le P \le 78$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 2P-79};

$79 \le P \le 117$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K3) mod 312)+ 1, i = 0, 1, …., 2P-157}; and

$118 \leq P \leq 156$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U

{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 77} U

{s| s = ((4i+K3) mod 312) +1, i = 0, 1, …., 77} U

{s| s = ((4i+K4) mod 312)+1, i = 0, 1, …., 2P-235}, wherein

$1 \leq s \leq 312$,

$0 \leq K1, K2, K3, K4 \leq 311$,

(Km mod 4)≠(Kn mod 4) for m≠n, and

$1 \leq m, n \leq 4$.

4. A VSB communication system of claim 1, wherein 'P' denotes a number of the supplemental data packets, and 's' denotes a supplemental data segment position with respect to a field synchronizing signal within the multiplexed data field, and

a MAP of the supplemental data segment in the multiplexed data field is expressed by the following equations:

$0 \leq P \leq 39$: MAP = {s| s = 4i+1, i = 0, 1, …., 2P-1};

$40 \leq P \leq 78$: MAP = {s| s = 4i+1, i = 0, 1, …., 77} U

{s| s = 4i+3, i = 0, 1, …., 2P-79};

$79 \leq P \leq 117$: MAP = {s| s = 4i+1, i = 0, 1, …., 77} U

{s| s = 4i+3, i = 0, 1, …., 77} U

{s| s = 4i+2, i = 0, 1, …., 2P-157}; and

$118 \leq P \leq 156$: MAP = {s| s = 4i+1, i = 0, 1, …., 77} U

{s| s = 4i+3, i = 0, 1, …., 77} U

{s| s = 4i+2, i = 0, 1, …., 77} U

{s| s = 4i+4, i = 0, 1, …., 2P-235}, wherein ($1 \leq s \leq 312$).

5. A VSB communication system of claim 1, wherein a pattern period for multiplexing the supplemental data and the MPEG data for forming the multiplexed data field is four segments.

6. A VSB communication system of claim 1, wherein the VSB transmission system includes:

a Reed-Solomon coder that codes the supplemental data;

a null sequence inserter for inserting a null sequence to the supplemental data outputted from the Reed-Solomon coder for generating a predefined sequence;

an MPEG header inserter for inserting a header to the supplemental data having the null sequence inserted therein; and

a multiplexer for multiplexing the MPEG data and the supplemental data having the header inserted thereto according to a multiplexing ratio, wherein the multiplexing ratio is determined in response to the number of the supplemental data packets; and

a VSB transmission system connected to the multiplexer for modulating a multiplexer output to form at least one data field comprising a plurality of segments that includes at least one segment formed from the supplemental data and at least one segment formed from the MPEG data.

7. A VSB communication system of claim 6, wherein the number of the supplemental data packets multiplexed within one multiplexed data field is between 0 to 156.

8. A VSB communication system of claim 6, further comprising an interleaver receiving data from the Reed-Solomon coder and outputting to the null sequence inserter, the interleaver interleaves the supplemental data containing forward error corrected code.

9. A VSB communication system of claim 6, wherein the multiplexing ratio of the supplemental data and the MPEG data is one segment to one segment (1:1) or one segment to three segments (1:3).

10. A VSB communication system of claim 6, wherein the multiplexing information is contained in at least one of a reserved area of a field synchronizing signal segment in the multiplexed data field and a first supplemental data segment after the field synchronizing signal segment.

11. A VSB communication system of claim 10, wherein the reserved area includes 92 symbols having a current 'P' value, a count down value before changing the current 'P' value, and a next 'P' value.

12. A VSB communication system of claim 11, wherein the current 'P' value occupies at least 8 bits, the count down value before changing the current 'P' value occuplies at least 8 bits, and the next 'P' value occupies at least 8 bits.

13. A VSB communication system of claim 12, wherein the reserved area is divided into first and second 12 bit sections, the first and the second 12 bit section being inverted with respect to each other.

14. A VSB communication system of claim 13, wherein the second 12 bit section is a bit-wise inversion of the first 12 bit section.

15. A VSB reception system for receiving a data field comprising multiplexed MPEG data and supplemental data, comprising:

a VSB receiver for receiving and decoding the data field;

a multiplexing information detector for detecting multiplexing information from the data field, wherein the multiplexing information contains at least information for determining a demultiplexing ratio to segregate MPEG data segments from supplemental data segments in the data field;

a demultiplexer for demultiplexing the data field in response to the demultiplexing ratio to produce the MPEG data and a coded supplemental data; and

a supplemental data decoder for processing the coded supplemental data from the demultiplexer to obtain the supplemental data.

16. A VSB reception system of claim 15, wherein the multiplexing information is included in a field synchronizing signal segment of the data field.

17. A VSB reception system of claim 15, further comprising:

a sequence generator for decoding a symbol of the supplemental data and generating a sequence to included to the supplemental data and defined in advance, wherein the VSB receiver uses the generated sequence to decode the data field and providing a processed data field to the demultiplexer.

18. A VSB reception system of claim 15, wherein the multiplexing information is included in a reserved area of one of supplemental data segments in the data field.

19. A VSB signal segment format for used in a VSB transmission system with a supplemental data coder and a VSB reception system with a supplemental data decoder, the VSB transmission system transmitting at least one data field containing MPEG and supplemental data segments, the signal segment format comprising:

a segment synchronizing symbol area;

at least one data symbol area;

a VSB mode symbol area;

a precode symbol area; and

a reserved area having multiplexing information for deciphering the position of the supplemental data segments in the data field..

20. A VSB signal segment format of claim 19, wherein the position of the supplemental data segments in the data field is responsive to a number of supplemental data packets.

21. A VSB signal segment format of claim 19, wherein the segment synchronizing symbol area contains 4 symbols, a first data symbol area contains 511 symbols, a second data symbol area contains 62 symbols, a third data symbol area contains 63 symbols, a fourth data symbol area contains 63 symbols, the VSB mode symbol area contains 24 symbols, the precode symbol area contains 12 symbols, and the reserved area contains 92 symbols.

22. A VSB signal segment format for used in a VSB transmission system with a supplemental data coder and a VSB reception system with a supplemental data decoder, the VSB transmission system transmitting at least one data field containing MPEG and supplemental data segments, the signal segment format comprising:

a first area for storing a current 'P' value, wherein P represents a number of supplemental data packets in the current field;

a second area for storing a count down value before changing the current 'P' value; and

a third area for storing a next P value to be changed.

23. A VSB signal segment format of claim 22, wherein the current 'P' value occupies at least 8 bits, the count down value before changing the current 'P' value occuplies at least 8 bits, and the next 'P' value occupies at least 8 bits.

24. A VSB signal segment format of claim 23, wherein a total of 24 bits is divided into first and second 12 bit sections, the first and the second 12 bit section being inverted with respect to each other.

25. A VSB signal segment format of claim 24, wherein the second 12 bit section is a bit-wise inversion of the first 12 bit section.

26. A method for processing MPEG and supplemental data packets in a VSB transmission system with a supplemental data coder, wherein the supplement data coder generates coded supplemental data packets from the supplemental data packets, the method comprising the steps of:

(a) multiplexing the coded supplemental data packets and MPEG data packets in at least one data field, the data field having a plurality of segments, each segment corresponding to at least one of the coded supplemental data packets and the MPEG data packets, wherein the multiplexing is performed in response to a number of the supplemental data packets; and

(b) modulating the multiplexed data field in the VSB transmission system.

27. A method of claim 26, further comprising:

(c) subjecting the supplemental data packets to Reed-Solomon coding for error correction;

(e) inserting a null sequence into the Reed-Solomon coded supplemental data packets; and

(f) adding the MPEG header to the supplemental data packets having the null sequence inserted therein to obtain the coded supplemental data packets.

28. A method of claim 27, further comprising the step of interleaving the supplemental data packets for enhancing resistance to burst noise before the step (e).

29. A method of claim 26, wherein the supplemental data packets to be multiplexed with the MPEG data packets are between 0 to 156 packets.

30. A method of claim 26, wherein the supplemental data packets and the MPEG data packets are multiplexed at a ratio of at least one of 1:1 and 1:3.

31. A method of claim 26, wherein the multiplexing information is included in at least one of a segment containing a field synchronizing signal and a first supplemental data segment next to the field synchronizing signal in the data field.

32. A method of claim 26, wherein the multiplexing information is included in at least one of a segment containing a field synchronizing signal and a reserved area of a first supplemental data segment next to the field synchronizing signal in the data field.

33. A method of claim 26, wherein 'P' denotes a number of the supplemental data packets, 's' denotes a supplemental data segment position with respect to a field synchronizing signal within the multiplexed data field, and K1, K2, K3, and K4 indicate offsets for adjusting starting positions of the supplemental data segments with reference to the field synchronizing signal, and

a MAP of the supplemental data segment in the multiplexed data field is expressed by the following equations:

$0 \le P \le 39$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 2P-1};

$40 \le P \le 78$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 2P-79};

$79 \le P \le 117$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K3) mod 312)+ 1, i = 0, 1, …., 2P-157}; and

$118 \le P \le 156$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K3) mod 312) +1, i = 0, 1, …., 77} U
{s| s = ((4i+K4) mod 312)+1, i = 0, 1, …., 2P-235}, wherein
$1 \le s \le 312$,

$0 \leq K1, K2, K3, K4 \leq 311$,

$(Km \bmod 4) \neq (Kn \bmod 4)$ for $m \neq n$, and

$1 \leq m, n \leq 4$.

34. A method of claim 26, wherein 'P' denotes a number of the supplemental data packets, and 's' denotes a supplemental data segment position with respect to a field synchronizing signal within the multiplexed data field, and

a MAP of the supplemental data segment in the multiplexed data field is expressed by the following equations:

$0 \leq P \leq 39$: $MAP = \{s \mid s = 4i+1, i = 0, 1, \ldots, 2P-1\}$;

$40 \leq P \leq 78$: $MAP = \{s \mid s = 4i+1, i = 0, 1, \ldots, 77\} \cup \{s \mid s = 4i+3, i = 0, 1, \ldots, 2P-79\}$;

$79 \leq P \leq 117$: $MAP = \{s \mid s = 4i+1, i = 0, 1, \ldots, 77\} \cup \{s \mid s = 4i+3, i = 0, 1, \ldots, 77\} \cup \{s \mid s = 4i+2, i = 0, 1, \ldots, 2P-157\}$; and

$118 \leq P \leq 156$: $MAP = \{s \mid s = 4i+1, i = 0, 1, \ldots, 77\} \cup \{s \mid s = 4i+3, i = 0, 1, \ldots, 77\} \cup \{s \mid s = 4i+2, i = 0, 1, \ldots, 77\} \cup \{s \mid s = 4i+4, i = 0, 1, \ldots, 2P-235\}$, wherein $(1 \leq s \leq 312)$.

35. A method of claim 26, wherein a pattern period for multiplexing the supplemental data and the MPEG data for forming the multiplexed data field is four segments.

36. A method for processing MPEG and coded supplemental data packets in a VSB reception system having a supplemental data decoder to generate the supplemental data packets from the coded supplemental data packets, the method comprising the steps of:

(a) detecting multiplexing information from a data field received by the VSB reception system, the multiplexing information being prepared in response to a number of the supplemental data packets and containing demultiplexing information for separating supplemental data segments and the MPEG data segments;

(b) demultiplexing the data field into the MPEG data packets and the coded supplemental data packet by using the multiplexing information; and

(c) using the supplemental data decoder, decoding the coded supplemental data packets to obtain the supplemental data packets.

37. A method of claim 36, wherein the multiplexing information is included with a field synchronizing signal of the data field.

38. A method of claim 36, further comprising the steps of:

(d) the VSB reception system indicating the supplemental data symbol and generating a predefined sequence to be included to the supplemental data packets; and

(e) processing the data field by using the generated sequence.

39. A method of claim 36, wherein the multiplexing information is included in a reserve area of a first supplemental data segment next to the field synchronizing signal.

40. A method of claim 36, wherein the multiplexing information includes:

a first area for storing a current 'P' value, wherein P represents a number of supplemental data packets in the current field;

a second area for storing a count down value before changing the current 'P' value; and

a third area for storing a next P value to be changed.

41. A method of claim 40, wherein the current 'P' value occupies at least 8 bits, the count down value before changing the current 'P' value occupies at least 8 bits, and next P value to be changed occupies at least 8 bits.

42. A method of claim 41, wherein a total of 24 bits is divided into first and second 12 bit sections, the first and the second 12 bit section being inverted with respect to each other.

43. A method for multiplexing MPEG data and supplemental data in a VSB transmission system, comprising the steps of:

determining a number of supplemental data packets to be multiplexed with MPEG data segments in a data field, wherein the data field includes a plurality of MPEG and supplemental data segements; and

assigning a position of the supplemental data segment to every Y segment of the data field starting from a preselected start position of the data field in sequential order until the end of the data field, and assigning remaining supplemental data segments to every Y segment of the data field starting from a subsequent start position that is offset by a predefined offset position from a previous start position of the data field.

44. A method of claim 43, wherein Y is a fourth segment.

45. A method of claim 43, wherein the predefined offset position is one segment.

46. A method of claim 43, wherein the preselected start position is adjacent to a field synchronization signal segment.

47. A method of claim 43, wherein 'P' denotes a number of the supplemental data packets, 's' denotes a supplemental data segment position with respect to a field synchronizing signal within the multiplexed data field, and K1, K2, K3, and K4 indicate offsets for adjusting starting positions of the supplemental data segments with reference to the field synchronizing signal, and

a MAP of the supplemental data segment in the data field is expressed by the following equations:

$0 \leq P \leq 39$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 2P-1};

$40 \leq P \leq 78$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 2P-79};

$79 \leq P \leq 117$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K3) mod 312)+ 1, i = 0, 1, …., 2P-157}; and

$118 \leq P \leq 156$: MAP = {s| s = ((4i+K1) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K2) mod 312)+1, i = 0, 1, …., 77} U
{s| s = ((4i+K3) mod 312) +1, i = 0, 1, …., 77} U
{s| s = ((4i+K4) mod 312)+1, i = 0, 1, …., 2P-235}, wherein
$1 \leq s \leq 312$,
$0 \leq K1, K2, K3, K4 \leq 311$,
(Km mod 4)≠(Kn mod 4) for m≠n, and
$1 \leq m, n \leq 4$.

48. A method of claim 43, wherein 'P' denotes a number of the supplemental data packets, and 's' denotes a supplemental data segment position with respect to a field synchronizing signal within the data field, and

a MAP of the supplemental data segment in the data field is expressed by the following equations:

$0 \leq P \leq 39$: MAP = {s| s = 4i+1, i = 0, 1, …., 2P-1};

$40 \leq P \leq 78$: MAP = {s| s = 4i+1, i = 0, 1, …., 77} U
{s| s = 4i+3, i = 0, 1, …., 2P-79};

$79 \leq P \leq 117$: MAP = {s| s = 4i+1, i = 0, 1, …., 77} U

$\{s|\ s = 4i+3, i = 0, 1, \ldots., 77\}$ U

$\{s|\ s = 4i+2, i = 0, 1, \ldots., 2P-157\}$; and

$118 \leq P \leq 156$: MAP = $\{s|\ s = 4i+1, i = 0, 1, \ldots., 77\}$ U

$\{s|\ s = 4i+3, i = 0, 1, \ldots., 77\}$ U

$\{s|\ s = 4i+2, i = 0, 1, \ldots., 77\}$ U

$\{s|\ s = 4i+4, i = 0, 1, \ldots., 2P-235\}$, wherein $(1 \leq s \leq 312)$.